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shall endeavor in the next chapter to explain these laws and to show how they may be illustrated by the simple cases of motion already discussed; we then go on to assume them as true always and to deduce their consequences in other cases." By way of proper caution he adds, however, that "We shall not now discuss the question whether these fundamental principles were stated in their best form by Newton. Our present object is to give a consistent account of the Science of Mechanics as it has been developed from Newton's laws."

The following chapters VI-VIII are devoted to the consideration of Newton's laws of motion and the consequences deducible therefrom. The presentation of these matters is admirable and must take rank with that given in the best works hitherto published. Indeed, though the book professes to be elementary only, its exposition of these matters appears to be as luminous and complete as can be given without the aid of the calculus.

The last three chapters deal with curvilinear motion of a particle under gravity, collision of masses, and motion of a particle in a circle respectively. The book has many well chosen illustrative examples, whose answers are given in most, though, properly, not in all cases. There are a few samples of examination questions given, and the book terminates with a good index.

The faults of the work, if any may be fairly urged against it, are faults of omission rather than of commission. The only one which seems worthy of mention is the absence of an explanation and a use of the theory of the dimensions of the units which figure in mechanical quantities. Nothing, we believe, helps more to fix ideas with regard to the terms force, momentum, energy, etc., in mechanics than a knowledge of that theory, while its application is of great aid to the student in detecting and in correcting his blunders. An application of this theory, for example, will immediately detect the misprint in the formula on p. 187 of the book; though it is but just to add that this is the only misprint which that theory has disclosed in our reading of the book. We may express the hope that future editions of this capital work will be improved by the addition of an appen-

dix explaining the doctrine of units and dimensions of units in mechanical quantities and indicating the great utility of the doctrine to students and investigators.

R. S. WOODWARD.

Fourteenth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1892-93. By J. W. POWELL, Director. Part I. Report of the Director. Part II. Geology—accompanying papers (Vignette). Washington, Government Printing Office. 1893. 8°, 2v.

Volume I., of 321 pages, is taken up by the administrative reports of heads of divisions and by other executive matters. The only general interest that it possesses lies in the fact that it sets forth the plans and policies of the Director and of the above officials. The second volume contains a valuable series of accompanying papers, viz:

1. Potable Waters of the Eastern United States, W J McGee, pp. 5-47.
2. Natural Mineral Waters of the United States, A. C. Peale, pp. 53-88.
3. Results of Stream Measurements, F. H. Newell, pp. 95-155.
4. The Laccolithic Mountain Groups of Colorado, Utah and Arizona, Whitman Cross, pp. 165-241.
5. The Gold-Silver Veins of Ophir, California, Waldemar Lindgren, pp. 249-284.
6. Geology of the Catocin Belt, Arthur Keith, pp. 293-395.
7. Tertiary Revolution in the Topography of the Pacific Coast, J. S. Diller, pp. 403-434.
8. The Rocks of the Sierra Nevada, H. W. Turner, pp. 441-495.
9. Pre-Cambrian Igneous Rocks of the Unkar Terrane, Grand Canyon of the Colorado, Arizona, Charles D. Walcott, with notes on the Petrographic Character of the Lavas, by Joseph Paxson Iddings, pp. 503-525.
10. On the Structure of the Ridge between the Taconic and Green Mountain Ranges in Vermont, T. Nelson Dale, pp. 531-549.
11. On the Structure of Monument Mountain in Great Barrington, Mass., T. Nelson Dale, pp. 557-565.
12. The Potomac and Roaring Creek Coal

Fields in West Virginia, Joseph D. Weeks, pp. 573-590.

The first paper has popular interest but no geological importance. The second is an excellent summary of the country's mineral springs and will be often serviceable for reference. A list of the leading ones by States is included. The third paper has valuable data on the amount of flow in Western rivers, and on the Potomac, Connecticut and Savannah in the East. It will aid in the advancement of irrigation in the West, and our general hypsometric knowledge. The fourth paper is a most important contribution to the geology and petrography of the area discussed. It shows the great part played by laccolites in some of the best known Colorado mountains and the close parallelism that exists among them all in the character of the rocks. In the fifth paper Mr. Lindgren ably discusses the interesting gold-quartz veins of the Ophir district, Placer county, and draws some well based conclusions as to their method of origin. In the sixth paper Mr. Keith brings out a vast amount of new and important knowledge about the metamorphic and paleozoic belt that passes from Pennsylvania south through Hagerstown and Harper's Ferry, Md., and across West Virginia and Virginia to the Rappahannock River. Besides describing the local structural geology, and its development the paper includes an important contribution to the dynamic metamorphism of pre-Cambrian igneous rocks, both plutonic and volcanic. In the seventh paper Mr. Diller takes up the Tertiary changes in that most interesting problem, the recent geological history of the Pacific coast. The ancient base levels are traced and many important conclusions are deduced, which have a close connection with the auriferous gravels. Mr. Turner's paper (the eighth) presents an admirable review of the geology of the Sierras and adds greatly to our knowledge of their petrography. In the first part of the ninth paper Mr. Walcott describes the relations of the pre-Cambrian lava sheets to the other Algonkian terranes of the Grand Canyon, and gives detailed sections and views. Prof. Iddings identifies them as surface or submarine flows of basalt. In the tenth and eleventh papers Prof. Dale extends the area covered by his previously pub-

lished work in the metamorphic belt of the New York and New England border and especially in the latter, clears up the geology of a mountain famous alike for its geology and lovely scenery. Both papers are also important contributions to our knowledge of the mineralogical changes involved in the passage of sediments into schists and marbles. In the last paper Mr. Weeks describes, under the name of the Potomac basin, the important coal field that extends from Wellersburg, Pa., across Maryland into West Virginia, and that embraces the Cumberland or George's Creek coal of Maryland, and the Elk Garden and Upper Potomac coals of West Virginia. Analyses, sections and statistics are given.

The Production of Tin in Various Parts of the World. By CHARLES M. ROLKER. Advance excerpt from the Sixteenth Annual Report of the Director of the U. S. Geological Survey. 1894-1895. Part III. Mineral Resources of the United States. Calendar Year. 1894. Pp. 1-88.

It would appear from the above reference that the forthcoming annual reports of the Director of the Survey are to have a regular department devoted to Mineral Resources. This is to be warmly commended, both because it affords material that is of value to the general public, which is after all the Survey's real constituency, and because it caters to the scientific public as well. Many friends of the Survey have viewed with regret in recent years the small prominence that this portion of its work has received, and have felt that it was a mistaken policy.

Mr. Rolker gives an admirable and concise review of tin ores, their geology, statistics and the expense of production the world over. The report covers much the same ground in many respects as that treated by Professor Ed. Reyer in his 'Zinn, eine geologisch-montanistisch-historische Monografie,' that appeared in Berlin in 1881, but Mr. Rolker brings the subject down to date, omits many theoretical discussions and makes especially prominent those points that are of importance in their practical relations. The geology of cassiterite is curiously uniform, wherever the mineral is found. Veins in or